fused by the term "pass" in speaking of high and low selective amplifications. If others are having similar difficulty from this usage, might it not be better at the start to accustom ourselves to the terms of "high selective amplification" and "low selective amplification"? Perhaps such a change is unimportant, but we feel that it would have helped us in the beginning. Accuracy of diagnosis is greatly promoted by graphically charting each audiometric study.

INTRACRANIAL HYPERTENSION AND SEROUS MENINGITIS

By EDWARD W. TWITCHELL, M. D., *San Francisco*

Serous meningitis is in its simplest form a very common thing.

Puncture should be far more often done than it is.

The procedure itself is so trivial that if there is any chance of help it should be used.

A means of differentiating between meningitis circumscripta and a new growth has not been found.

DISCUSSION *by Howard W. Fleming, San Francisco; C. E. Locke, Jr., Cleveland, Ohio; I. Leon Meyers, Los Angeles.*

AFTER the specific causes of the various types of meningitis became known, there was reluctance on the part of physicians to admit or recognize a meningitis which might consist in an increase of fluid and intracranial tension, without the presence and growth of organisms. The term "meningitis" was felt to connote bacterial growth, pleocytosis, marked inflammation, and, except in the case of epidemic meningitis, a uniformly fatal prognosis. Meningism was, to be sure, rather a popular term, but vaguely meant a meningeal irritation by blood-borne toxins, a passing manifestation with no demonstrable pathology. For years cases of meningeal irritation were reported—some of them making surprising recoveries, others ending fatally, with relatively minor meningeal findings at autopsies. Some such as Austin Flint's case were, of course, tuberculous in nature; others were hydrocephalic. Those which got well must have come in another category.

The problem did not advance toward solution until Quincke introduced lumbar puncture as a routine diagnostic procedure. He reported a number of cases with favorable outcome. Some were hydrocephalic children, in whom an intercurrent disease was responsible for the aggravation of intracranial pressure; others were syphilitic and responded to mercury and iodine, but they had outspoken signs of meningeal irritation which after a time subsided. Some of the more acute cases subsided in a few days after puncture.

The constant symptoms were headache, retraction of the neck, vomiting, defective pupillary reaction, confusion, delirium, unconsciousness at times, and occasionally edema of the optic disc. Nystagmus and staggering gait occasionally occurred. The spinal fluid sometimes showed great increase in pressure. Spinal fluid findings were usually negative. Quincke's first paper antedated the present-day serology and cytology, but in his later case reports the fluid often proved Wassermann negative, with normal cell count and globulins in many instances.

Quincke grouped his cases thus: (a) Those with acute onset with acute or chronic course. (b) Those with gradual onset with either a chronic progressive course or with acute exacerbations. Many cases he regarded as instances of exacerbations of chronic hydrocephalus. According to Quincke, the chief causes were injury, mental strain, alcohol, and fever. Infection was not regarded as necessary. In fact, said he, the causes were the same as for accumulations of fluid in the pleural or peritoneal cavities. He specifically mentioned instances of arachnitis with cyst formation, and cites the cases reported by Oppenheim and Borchardt.

Placzek and Krause, in 1907, reported the case of a patient suffering from giddiness, diplopia, vomiting, and paralysis of the right facial and left lateropulsion. Operation by Krause disclosed a cyst at the undersurface of the cerebellum. Unger, in 1909, reported a case with symptoms pointing to tumor at the cerebello-pontile angle. Here syphilis was proven and mercury and iodine used, but severe papillitis developing with diplopia and adiadokokinesis, the patient was operated upon and cured by destruction of a cyst. In 1910 Oppenheim and Borchardt reported the case of a 7-year-old girl who fell from a street-car, striking the occiput. Subsequent symptoms led to the diagnosis of brain tumor, and at operation a wine-glassful of cystic fluid was obtained from the cavity of the thickened arachnoid. Bing, in 1911, reported an instance of cyst of the cisterna magna cured by operation. Quincke, Braun and Lewandowsky and others draw attention to the fact that these cysts often form after a severe blow upon the head, as in the case of the child cited above from Borchardt. Quincke speaks of a "clear case of meningitis serosa traumatica."

Redlich, in Lewandowsky's Handbuch, speaks of the difficulty in differentiating between these cysts and neoplasms. In cases of rapidly developing meningitis serosa following ear trouble, the relief obtained by lumbar puncture, according to Redlich, is of much diagnostic value.

Finkelnburg (Lewandowsky Handbuch) finds neuritis and papillitis common. The pathological findings in fatal cases are "recht spärlich." A flattening of convolutions, injection of vessels, increased fluid with cloudiness are seen, and often many bacteria. This last statement makes one wonder how such cases are kept in the class of the ordinary meningitis.

Among the more important papers of later years are those of H. Claude in Questions Neurologique d'actualite and in L'Encephale. He reviews the subject from the time of Quincke in particular, and cites the early surgical cases of Emmerson and Frazier. The occasional cystic formation, as a result of arachnoid adhesions in other parts of the brain than the base, are described, and one case of marked depression of the convexity is pictured. Mention is made of other cases reported by Muskens, Ströbe, and Uréchia. He insists upon the damage done to the hypophysis by increased intracranial pressure, and cites instances where it has been almost destroyed. From that result what he called the "syndromes endocriniens secondaires."

Claude is a vigorous advocate of the routine use of the manometer for determining the degree of pressure of the spinal fluid. He makes the usual statement that rapidity of flow at the time of puncture is no index as to the pressure, or rather that, with very high pressure, the fluid may come slowly, drop by drop. This is true only if there is some impediment to the flow. Given needles of constant caliber and a limpid fluid, the rate of flow is directly as the pressure. If the needle be stopped partially, or the fluid thick, the flow will be slowed, regardless of the pressure behind it. This much, however, is always true: a spurt of fluid means very high pressure. The Queckenstedt manoeuvre of compression of the jugulars during withdrawal of fluid will give some idea as to whether or not there is any impediment to the flow.

Claude insists that lumbar puncture be done always where there is persistent headache, vertigo, and vomiting. This should be modified by the statement; provided that one can be sure that there is no danger of the pressure from above pressing the medulla down into the foramen magnum. If a very fine needle is used and but a small amount of fluid withdrawn, this danger is much lessened. It is true, however, that lumbar puncture should be done far oftener than is now customary. Many a severe headache in the course of active infectious disease would be relieved by lowering the pressure and leaving an opening in the dura through which drainage could keep up for a day or two.

Claude holds that circumscribed cortical serous meningitis is indicated by general symptoms of hypertension with low manometric reading, focal epilipsies, myoclonus, and absence of papillitis. He mentions one case of cyst beneath the cerebellum diagnosed as such before operation. One of the points of differentiation from a neoplasm was absence of edema of the disc. As one of my own cases will show, this is by no means a criterion.

Within the past year a number of cases have come to my notice, in which the outstanding symptoms pointed to intracranial hypertension, and I have chosen four of them as representing some of the types emphasized by Quincke and Claude. Three of the four are at present in good health, although one was subjected to a formidable operation. The one who died, died, we believe, from causes not connected with the meningeal condition.

CASE I—A. F., aet. 29, nat. California. Entered St. Francis Hospital 2-24-1923. For one month he has been complaining of severe frontal headache, chiefly over either eye. An x-ray examination showed evidence of slight sinusitis. Temperature was 101.5 degrees, pulse 60, respiration 17. At the time of entrance, the headache had become very severe and there was mental confusion and persistent vomiting. There were rigidity of neck and other signs of meningeal irritation. Urine was normal and so was the blood, aside from a leucocytosis of 10,500. Fundi were normal. A lumbar puncture brought a clear fluid under increased pressure, with normal cell count and globulins and negative Wassermann. Soon after puncture, the headache, vomiting, and other signs of meningeal irritation lessened. In three days the patient was in a normal condition and has remained so since. This is a good example of Quincke's Class "A"; acute onset and acute course with rapid relief after puncture.

CASE II—J. McK., aet. 20, nat. California. Entered St. Francis Hospital 8-23-23. There had been complaint of shortness of breath for months, of occipital headache for eleven days, and of vomiting for the last day or two. This patient was exhausted by far advanced mitral stenosis, and when meningeal signs showed themselves, a tuberculous meningitis was suspected. The patient was delirious, with retracted head and positive Kernig. The spinal fluid, which was under increased pressure, was Wassermann negative. There were no organisms, no increase of cells, and no web on standing. Under daily spinal drainage, the signs of meningeal irritation disappeared and the patient regained consciousness. Suddenly he died, supposedly as a result of the heart lesion. Blood and spinal fluid cultures had shown no growth. The relief from spinal drainage was very striking in this case and we at one time were hopeful for recovery, though aware that it could be but temporary on account of the advanced decompensation. Unfortunately, an autopsy could not be obtained.

CASE III—A. G., aet. 11, nat. San Francisco. Entered isolation ward of San Francisco Hospital moaning, unconscious, head extended, pupils dilated, and extremities rigid. He had been struck on the back of the head in a fight ten days before entry. Twenty-four hours before entry he became feverish and was found unconscious on the floor of his bedroom. He vomited several times. The nose was bloody. Brudzinski and Kernig positive. Babinski group of reflexes all positive. Leucocytosis of 29,000. On puncture, the spinal fluid squirted at least a foot. There were 18 lymphocytes per cubic mm. and increased globulins. No organisms were seen in the smear, and no growth in culture at first. Later, staph. albus was reported with a question of contamination. Nasal smear was negative. A subsequent spinal puncture showed normal cell count. The fever subsided rapidly. At the end of a week the patient was discharged in apparently normal condition. It has been learned that the patient had a mild recurrence several weeks after going home, but at present writing is well.

In this case the blow on the head probably played a large part. It was what Quincke would have called "a clear case of meningitis serosa traumatica."

CASE IV—Mrs. W., aet. 36, nat. Austria. Married at 16 and infected by her husband, who has since died. She had as treatment only some medicine which he purchased at a drug store. She began to have "peculiar headaches" in 1912. These headaches sometimes ended in unconsciousness. She remembers once calling, "Come quick, help," and then becoming unconscious. In 1920 she came to San Francisco and at that time suffered greatly with thirst and polyuria. This undoubtedly was due to the hypophyseal compression, of which Claude speaks. By September, 1920, she was so blind that she had to be led around. Then she was given vigorous anti-syphilitic treatment and recovered her sight. She never menstruated after 1920, another associated endocrine symptom. In May, 1923, things crew worse again and the headaches were so severe that she yelled, as she expressed it. She had a spell of projectile vomiting and her eyes crossd. She talked indistinctly and grew irrational. Finally the left arm and the fingers of the left hand grew numb. She entered St. Francis Hospital 6-30-23 stuporous. The pupils were equal with poor reaction to light. The left abducens was weak. The discs were blurred and swollen, and there were hemorrhages and exudate in the retinae. There were lft-sided asthenia, adiadokokinesis and dysmetria. A diagnosis of tumor in the left posterior fossa was made. Operation was done by Dr. Howard W. Fleming on July 1. A cyst was found occupying the space of the cisterna magna, walled by an arachnoid that was thickened like chamois skin. She left the hospital, ambulant, on July 24, but soon had a return of some symptoms, especially an uncontrollable vomiting. The discs, which had receded, swelled again and she was taken to the University of California Hospital. Here she was given intravenous injections of sodium iodide. Gradually she grew better. Her weight increased from 91 to 145 pounds, and her strength grew progressively greater. The nerve heads now are flat, vision is good, and the cerebellar signs are almost vanished. There was for some time a great deal of occipital soreness, but that has for the most part disappeared. It may be noted here that several blood Wassermanns in recent years were negative. I have omitted all discussion of surgical details, with the idea that that side of the case will be subsequently treated by Dr. Fleming, upon whom the whole burden of the operation fell.

The first of these cases is one of acute hypertension of unknown origin. It is the type we see oftenest, and many such are recorded by Quincke, Claude and others. The symptoms of headache, retraction, vomiting, and mental confusion were pronounced. For unknown reasons there was a sudden rise of tension which produced them. Shortly after withdrawal of what appeared normal fluid, all symptoms subsided and the patient was rapidly restored to normal. The original cause probably being a transitory one, puncture was of undoubted value and was the only thing needed. The second case was a far more serious one. Some of the factors are still in doubt. No guinea pig injection was made and tuberculosis is a possibility, but the usual pleocytosis, increase of globulins, and web were wanting. The amelioration after repeated puncture was so marked that it was felt that the boy had a chance of recovery from the meningeal complex. The third case would come under Quincke's heading of meningitis serosa traumatica, but the leucocytosis of 29,000 is unexplained. The bloody nose made one think of extension of trouble from the sinuses, although nasal smears were negative. In any event, the puncture was a great help. The relapse after leaving the hospital was in keeping with the experiences of others. In such cases, cyst formation may result later.

The fourth case was one of meningitis serosa circumscripta syphilitica. Here a lumbar puncture might have been fatal, while cistern puncture might have given temporary relief. The only hope for the moribund woman was immediate operation, and fortunately it led to the finding and evacuation of a cyst. The reason for subsequent flare-up was never understood.

To sum up: Serous meningitis is, in its simplest form, a very common thing. It is one of the conditions in many cases of acute illness, and the distress which it causes can be relieved by prompt puncture. Puncture should be far more often done than it is. Whenever a headache is very persistent, and the usual remedies fail to relieve, puncture should be thought of. The procedure itself is so trivial that if there is any chance of help it should be used.

A means of differentiating between meningitis circumscripta and a new growth has not been found, but the fact that these cysts are rather frequent should keep one on the alert, for the operative treatment of them forms a very bright spot in what is a pretty dark corner of surgery.

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DISCUSSION

HOWARD W. FLEMING, M. D. (380 Post Street, San Francisco)—Dr. Twitchell has asked me to discuss the surgical features of the patient operated on. At the time the patient was first seen she appeared to be in extremis. Examination was difficult, due to the lack of co-operation. She was unconscious, there was moderate cervical rigidity. The fundi revealed bi-lateral choking of several diopters. The extra ocular muscles were uninvolved, and a facial paresis was apparent.

The history of findings, made prior to loss of consciousness, made a cerebellar involvement beyond question. Our pre-operative diagnosis was cerebellar tumor.

An emergency operation was done that day under ether anesthesia, with the patient in the prone position. The usual cross-bow incision was made and the occipital bone removed, including the posterior margin of the foramen magnum. Before opening the dura, it was necessary to puncture the lateral ventricle to reduce the intra-cranial pressure. The dura was opened widely, revealing a large cystic tumor, which was a part of, or overlying, the posterior cistern. The walls of the cyst were clear and appeared to be markedly thickened arachnoid tissue. It was necessary to cut the wall with a scissors before it could be opened widely. An abnormally large amount of fluid escaped. The greater part of the cyst was opened up and some excised for pathological examination. There was a marked herniation through the foramen magnum, and it was necessary to remove the lamina of the atlas and axis before the cerebellar tonsils could be elevated. The patient had a very stormy post-operative course. For several days her temperature rose as high as 105 and 106, with a very rapid pulse. About the seventh day she began to improve. All the neurological signs enumerated above disappeared. The choked discs subsided rapidly.

The patient had one relapse, which Twitchell has mentioned. At present she is feeling extremely well, and her only complaint is slight unsteadiness at times and a painful sensation in the region of the operative scar. Unfortunately, the tissue excised for diagnosis was lost in the pathological department. However, there is very little doubt but that this is a case of meningitis serosa-circumscripta. A search was made for a posterior fossa tumor and both lobes punctured. At the present time the patient has no herniation at the site of occipital decompression, and the discs show no evidence of choking. We feel that with effectual anti-luetic therapy her prognosis should be good.

C. E. LOCKE, JR., M. D. (Cleveland Clinic, Cleveland, Ohio)—I want to thank Dr. Twitchell for his most excellent and instructive paper. Three cases, similar in symptomatology and operative findings to Twitchell's Case IV, yet with no proof of syphilis, have come to my notice. In one of these patients, histological study of the thickened arachnoid membrane showed definite round-cell infiltration. All three of these cases did exceedingly well after operation.

The differential diagnosis of circumscribed serous meningitis and brain tumor presents a difficult problem, especially when the latter is located in the posterior fossa. In this region, as the result of interference of the circulation of the cerebrospinal fluid, the pocketed subarachnoid fluid causes internal hydrocephalus and produces the usual signs and symptoms of increased intra-cranial pressure.

In contradistinction to tumor, it has been my experience that patients with circumscribed arachnoiditis of the posterior fossa complain of pain, stiffness and tenderness in the suboccipital region, diplopia and transient numbness of the extremities, and that the usual intracerebellar signs are less pronounced. With circumscribed arachnoiditis, the angle cranial nerve signs are usually absent, I believe. In cases of circumscribed serous meningitis, a preliminary history of a general acute infection may often be found.

I. LEON MEYERS, M. D. (517 Rillstreet Building, Los Angeles)—Serous meningitis as the cause of intra-cranial hypertension and its resulting manifestations is met with not only in conditions with general neurologic disturbances, but also in those with focal phenomena. It should, consequently, be considered as a possible cause of the trouble in any obscure case of intra-cranial hypertension.

Among the cases reported by Twitchell was one which followed a head injury. This coincides with the convictions which I have ascertained for some time that traumatic epilepsy, in the absence of focal irritation, is brought about by serous meningitis, the spinal fluid in these cases being practically always under increased tension. This is undoubtedly true of also the other so-called post-concussional syndromes, as, for example, the amnesic, the aphasic, and the labyrinthine, conditions which are also associated with increased fluid pressure, and not infrequently with the presence of globulin and a slight pleocytosis.

Particularly interesting, however, are the cases of serous meningitis with phenomena of focal brain irritation, such as Jacksonian spasms, cranial nerve palsies, nystagmus, and cerebellar signs. These cases are generally referred to as pseudo-tumors and have been noted even in the absence of such focal pathology as was found

in Dr. Twitchell's Case IV. Mohamed Saleh (1912) collected thirty-two such cases from the literature, in thirteen of which necropsy revealed pathology of only a minimal character.

A case of this type came under my observation at the Los Angeles General Hospital in 1922. The patient, a man 48 years of age, has bilateral ptosis of the upper eyelid, and marked limitation of all extra ocular movements, especially those which require the action of the right oculo-motorius. He had a horizontal nystagmus to the right, and was markedly ataxic. His gait was cerebellar in type, and he tended to fall forward and to the right. The subjective symptoms were: Severe headaches, deplopia on looking to the left, and dizziness. He was extremely apathetic. While at the hospital he had numerous attacks of unconsciousness, with convulsions. The convulsions were in the nature of tetanus-like seizures, and suggested a tumor of the vermis. There was no history of trauma. The Wassermann on his blood was negative, and the spinal fluid which was examined several times was, except for an increase in the tension, entirely negative. The patient remained in this stuporous condition for about ten days, and then began to improve. The improvement continued steadily, and within a week all symptoms and signs had disappeared so that he was able to go home. Professor Barany visited Los Angeles a few months later, and at my request examined this patient, but nothing abnormal was found, the patient stating at the same time that he felt perfectly well ever since he left the hospital. The marked improvement, and finally the complete disappearance in this patient of all signs and symptoms, which followed so closely, the lumbar punctures, and the absence of spinal fluid findings which are associated with epidemic (lethargic) encephalitis, leads one to believe that this was a case of serous meningitis of the type known as pseudo-tumor cerebri.

STRICTURE OF THE URETER AND DYSMENORRHOEA

By RAYMOND L. SCHULZ, M. D., *Los Angeles*

The chief reasons for this paper are to explain how stricture of the ureter develops, why it causes symptoms; how it may cause dysmenorrhoea; to emphasize some of the unusual features of the subject and to urge the importance of careful diagnostic treatment of these patients.

Stricture of the ureter should always be thought of in all cases of vague lower abdominal pain in either side; likewise severe menstrual pains.

Stricture of the ureter is perhaps the commonest urological condition that we have to deal with in women.

DISCUSSION *by Norman H. Williams, Los Angeles; Clarence W. Page, Berkeley; E. J. Eytinge, Redlands; R. H. Van Denburg, Los Angeles; Harry H. Wilson, Los Angeles.*

NOTWITHSTANDING the numerous articles on stricture on the female ureter, there are enough of these patients who go unrecognized for varying lengths of time, so that the subject is still of timely interest. Stricture of the ureter is perhaps the commonest urological condition that we have to deal with in women.

Many of the patients have had all sorts of examinations, without locating their trouble. The ordinary methods of cystoscopy, ureteral catherization, and pyelography may not reveal any abnormality, but by the proper method we can determine quite accurately if the symptoms originate in the urinary tract or not, and, if they do, we can reproduce exactly the pain from which these patients have been suffering so as to leave little doubt about a diagnosis.

Many of these patients have undergone operative procedures on the abdomen, such as removal of the appendix, gall-bladder exploration, removal of ovaries, tubes and uterus, without obtaining relief, when the underlying condition is stricture of the ureter. It is this lack of thorough diagnosis which tends to bring surgery into disrepute with some people. Too much emphasis cannot be placed upon the importance of considering the possibility of ureteral stricture in every case where there are vague abdominal pains, though at the same time we must not expect that this condition will explain every one of these puzzling cases. The tests for ureteral stricture should be used with discretion, depending upon history and physical findings.

A clearer understanding of the underlying pathological condition, its relation to focal infection and to physiological disturbances, should help in the earlier recognition of these cases.

Any condition that produces a chronic lymphadenitis of the pelvic lymph nodes, potentially, can be a causative factor in producing an ureteral stricture. Common causes are chronic tonsillitis, infections of the teeth, both of which are known to cause poisoning of remote parts of the body at times. Also chronic cervicitis following lacerations of the womb, infections of the tubes and ovaries by direct extension to the pelvic lymph nodes. If these conditions are treated, the inflammation of the lymphatics subsides, and sometimes the symptoms of pain from the ureteral obstruction quiet down. Many patients with pains from ureteral stricture give a history either of repeated attacks of tonsillitis or of having had considerable dental work, such as root fillings. In the absence of such a history, the mere inspection of the tonsils has revealed enlargement, and in one patient there was a chronic abscess about ready to break, though throat trouble was denied.

The usual location of simple strictures is in the broad ligament portion of the ureter, and also in that portion along the pelvic wall at the bifurcation of the internal iliac vessels. In both regions there are numerous lymph nodes in intimate contact with the ureter. Hunner reports that these have been found enlarged at operation, and that the stricture formation in the ureter varied from a slight annular degree to diffuse cartilage-like thickening, for several centimeters, of its length and to a thickness of 1 cm. The infiltration may be confined to the ureteral wall, or there may be much periureteritis.

Why should the pelvic lymph nodes of all the groups in the body be practically the only ones to cause trouble as a result of focal infection? How can the remote production of the ureteral stricture, as a result of repeated tonsillitis or other focal infection, be explained? First of all, these pelvic nodes are located next to a vital organ where only slight tissue changes are necessary to cause a disturbance. The lymphatics in other parts of the body are less likely to cause serious trouble on neighboring tissues, as long as they do not interfere with the functions of surrounding tissues. Inasmuch as the uret-